AMENDMENTS TO THE SPECIFICATION:

Amend the Title of the Specification as follows:

~~TRANSMISSION SIGNAL PRODUCTION METHOD,~~ COMMUNICATION METHOD~~, AND DATA STRUCTURE OF TRANSMISION SIGNAL~~

Please replace the paragraph beginning at page 1, line 8, with the following amended paragraph:

The present invention relates to ~~a transmission signal production method,~~ a communication method ~~using the transmission signal, and a data structure of the transmission signal and,~~ more particularly, is advantageous to a multi-path environment such as that of mobile communication.

Please replace the paragraph beginning at page 4, line 16, with the following amended paragraph:

A ~~transmission signal production~~ communication method according to the present invention comprises the steps of ~~multiplying transmission data by coefficients of a predetermined coefficient sequence to produce a plurality of transmission data; and adding 0 data of a predetermined length between the plurality of transmission data, produced by multiplying the transmission data by the coefficients, to produce a transmission data sequence, and the transmission data sequence created in this way is used as a transmission signal~~ :

producing a plurality of transmission data sequences

$S_{A,X}=(x_0A, 0\ldots0, x_1A, 0\ldots0, x_2A, 0\ldots0, \ldots, x_{m-1}A, 0\ldots0)$

$S_{B,Y}=(y_0B, 0\ldots0, y_1B, 0\ldots0, y_2B, 0\ldots0, \ldots, y_{m-1}B, 0\ldots0)$

(0 indicates a null time of a unit length where no signal is generated)

using a plurality of data sequences

$A=(a_0a_1\ldots a_{N-1})$, $B=(b_0b_1\ldots b_{N-1})$, ... and

a plurality of coefficient sequences

$X=(x_0x_1\ldots x_{m-1})$, $Y=(y_0y_1\ldots y_{m-1})$, ...; and

transmitting said plurality of transmission data sequences $S_{A,X}$, $S_{B,Y}$,... onto the same transmission line at the same time.

Please replace the paragraph beginning at page 4, line 25, with the following amended paragraph:

The ~~transmission~~ data sequence is digital data including information to be transmitted. On the other hand, the produced transmission data sequence becomes a transmission signal composed by arranging a plurality of ~~transmission~~ data sequences. In the arrangement of the plurality of ~~transmission data, the~~ ~~transmission~~ data sequences, the data sequence is multiplied by the coefficients of the predetermined coefficient sequence, and ~~the transmission data and 0 data of a predetermined length are arranged alternately~~ a null time of a predetermined length is placed between data sequences.

Please replace the paragraph beginning at page 5, line 2, with the following amended paragraph:

According to a first method for producing the transmission data sequence, the plurality of ~~transmission~~ data sequences, produced by multiplying the transmission data by the coefficients, are arranged at intervals by delaying for a time longer than the data length of the ~~transmission~~ data sequence and a ~~predetermined number of 0 data are arranged between neighboring transmission data~~ null time of a predetermined length is placed between data sequences.

Please replace the paragraph beginning at page 5, line 10, with the following amended paragraph:

According to a second method for producing the transmission data sequence, a null time of predetermined ~~number of 0 data are~~ length is added to the end of the ~~transmission~~ data sequence, the ~~transmission~~ data sequence to which the ~~0 data are~~ null time is added is multiplied by the coefficients of the predetermined coefficient sequence to produce the plurality of ~~transmission~~ data sequences, and the plurality of ~~transmission~~ data, sequences ~~produced by multiplying the transmission data by the coefficients,~~ are arranged in order of coefficients of the coefficient sequence to produce the transmission data sequence. Alternatively, the ~~transmission~~ data sequence is multiplied by the coefficients of the predetermined coefficient sequence to produce the plurality of ~~transmission~~ data sequences, ~~the~~ a null time of a predetermined ~~number of 0 data are~~ length is added to the end of each ~~transmission~~ data sequence, produced by multiplying the ~~transmission~~ data sequence by the coefficients, and the ~~transmission~~ data sequences to which the ~~0 data are~~ null time of a predetermined length is added, are arranged in order of coefficients of the coefficient sequence to produce the transmission data sequence.

Please replace the paragraph beginning at page 5, line 28, with the following amended paragraph:

Another mode of the transmission signal production method according to the present invention is a signal production method wherein a plurality of transmission data sequences are produced using different coefficient sequences and, in an arbitrary combination of two different transmission data sequences, a transmission data sequence is produced so that a finite number of the ~~transmission~~ data sequences included in the transmission data sequence have a range in which a non-periodic cross-correlation function is 0. The non-periodic cross-correlation function is a

cross-correlation function between transmission data sequences having a finite, not infinite, number of transmission data. The periodic spectrum of the transmission signal is made a non-correlation spectrum by producing the transmission data sequence having a finite number of ~~transmission~~ data sequences so that this cross-correlation function has a range in which its value becomes 0.

Please replace the paragraph beginning at page 6, line 20, with the following amended paragraph:

A communication method according to the present invention comprises the steps of ~~transmitting the~~ producing a plurality of transmission data sequences ~~produced by the transmission signal production method according to the present invention; and~~ for a plurality of data sequences using coefficient sequences different for each data sequence; transmitting the plurality of transmission data sequences; receiving ~~transmission~~ the transmitted transmission data ~~via a matched filter corresponding to the coefficient sequence used for producing the transmission data sequence~~ sequences as a reception signal; and restoring the plurality of transmission data sequences by passing the reception signal through matched filters corresponding to said coefficient sequences.

Please replace the paragraph beginning at page 8, line 1, with the following amended paragraph:

FIG. 1 is a general diagram showing a transmission signal production method according to the present invention and the data structure of a transmission signal according to the present invention; FIG. 2 is a diagram showing an example of a unitary matrix; FIG. 3 is a diagram showing an example of a transmission data sequence according to the present invention produced

by applying a unitary matrix to ~~transmission~~ a data sequence; FIG. 4 is a diagram showing the relation between ~~transmission~~ data sequences and a transmission data sequence according to the present invention; FIG. 5 is a diagram showing the relation between an input/output signal and a matched filter according to the present invention; FIG. 6 is a diagram showing the status of a data sequence when a signal passes through a matched filter; FIG. 7 is a diagram showing the relation between a pilot signal and transmission signals according to the present invention; FIG. 8 is a diagram showing the detection of multi-path characteristics using the pilot signal according to the present invention; FIG. 9 is a diagram showing the communication status of the transmission signal according to the present invention; FIG. 10 is a diagram showing the communication status of the transmission signal according to the present invention; FIG. 11 is a diagram showing an example of the configuration of matched filters applied to the present invention; and FIG. 12 is a diagram showing an example of a signal using a complete complementary sequence as a spreading code sequence.

Please replace the paragraph beginning at page 8, line 31, with the following amended paragraph:

A ~~transmission signal production, a~~ communication method, ~~and the data structure of a transmission signal~~ in the best mode for carrying out the present invention will be described below with reference to the drawings. The following describes embodiments of the present invention in detail with reference to the drawings.

Please replace the paragraph beginning at page 9, line 6, with the following amended paragraph:

FIG. 1 is a general diagram showing a transmission ~~signal production method of the present invention and the~~ data sequence ~~structure of a transmission signal~~ of the present invention.

Please replace the paragraph beginning at page 9, line 10, with the following amended paragraph:

According to the present invention, a transmission data sequence (shown in FIG. 1(c)) is produced from ~~transmission~~ a data sequence b (=(b0, b1, b2, b3, ..., bN-1)) (shown in FIG. 1(a)) by using a spreading sequence, and this transmission data sequence is used as a transmission signal. N is an arbitrary integer, and the data length of the transmission data is arbitrary N bits.

Please replace the paragraph beginning at page 9, line 17, with the following amended paragraph:

To produce the transmission data sequence B from the ~~transmission~~ data sequence (b0, b1, b2, b3, ..., bN-1) (shown in FIG. 1(a)), the transmission data (b0, b1, b2, b3, ..., bN-1) is multiplied by the coefficients of a coefficient sequence (1, -1, 1, -1) of a predetermined spreading sequence (shown in FIG. 1(b)) to produce a plurality of ~~transmission~~ data sequences B0(=(b0, b1, b2, b3, ..., bN-1)), B1(=(-1)·(b0, b1, b2, b3, ..., bN-1)), B2(=(b0, b1, b2, b3, ..., bN-1)), and B3(=(-1)·(b0, b1, b2, b3, ..., bN-1)). The processing, in which the ~~transmission~~ data sequence b (=(b0, b1, b2, b3, ..., bN-1)) is multiplied by the coefficients of the coefficient sequence (1, -1, 1, -1) of a predetermined spreading sequence, is represented by the Kronecker product as shown in FIG. 1(b).

Please replace the paragraph beginning at page 9, line 30, with the following amended paragraph:

Next, as shown in FIG. 1(c), the plurality of ~~transmission~~ data sequences, produced by multiplying the ~~transmission~~ data sequence by the coefficients, are arranged at an interval by delaying each data sequence for an interval of the predetermined length of T with a ~~predetermined number of 0 data~~ null time of a predetermined length placed between each two ~~transmission~~ data sequences ~~pieces~~ corresponding to the delay time of τ. The predetermined length T is set longer than the transmission data length N, and the data of zeros corresponding to (T-N) bits are arranged. This produces a transmission data sequence such as the one shown in FIG. 1(d). The interval between transmission data is created by delaying from the terminating end of ~~transmission~~ the data sequence to the starting end of the next ~~transmission~~ data sequence for a predetermined time of τ. Arranging the plurality of transmission data as described above creates an interval of null time corresponding to (T-N) bits between each two transmission data pieces.

Please replace the paragraph beginning at page 10, line 16, with the following amended paragraph:

Instead of delaying the ~~transmission~~ data sequence (b0, b1, b2, b3, ..., bN-1), produced by multiplying the transmission data by the coefficients of the predetermined coefficient sequence (1, -1, 1, -1), for a predetermined time, it is also possible to add (T-N) bits of ~~0 data~~ a null time to the end of the ~~transmission~~ data sequence (b0, b1, b2, b3, ..., bN-1) to produce ~~transmission~~ a data sequence (b0, b1, b2, b3, ..., bN-1, 0, ...,0) whose total data length is T bits; to multiply the transmission data, to which the ~~0 data~~ null time is added, by the coefficients of the predetermined coefficient sequence (1, -1, 1, -1) to produce a plurality of ~~transmission~~ data sequences (b0, b1, b2, b3, ..., bN-1, 0, ..., 0), (-1)·(b0, b1, b2, b3, ..., bN-, 0, ..., 01), (b0, b1, b2, b3, ..., bN-1, 0, ..., 0), and (-1)·(b0, b1, b2, b3, ..., bN-1, 0, ..., 0); and to arrange them in order of the coefficient sequence

to produce a transmission data sequence. Adding the (T-N) bits of ~~0 data~~ the null time corresponds to the operation of delaying for the time of τ.

Please replace the paragraph beginning at page 11, line 15, with the following amended paragraph:

FIG. 3 shows an example of a transmission data sequence produced by multiplying ~~transmission~~ data sequences A0-A3, B0-B3, C0-C3, and D0-D3 by the coefficients of each vector row of the unitary matrix and by adding a null time of a predetermined ~~number of 0 data~~ length.

Please replace the paragraph beginning at page 11, line 20, with the following amended paragraph:

A plurality of ~~transmission~~ data sequences can be produced by using the original ~~transmission~~ data sequence (1, 0, 0, 0) and by multiplying it by the coefficients of each vector row of the unitary matrix shown in FIG. 2. The ~~transmission~~ data sequences obtained from the first vector row of the unitary matrix ~~is~~ are A0=(1, 0, 0, 0), A1=(1, 0, 0, 0), A2=(1, 0, 0, 0), and A3=(1, 0, 0, 0) corresponding to the coefficients. The ~~transmission~~ data sequences obtained from the second vector row of the unitary matrix ~~is~~ are B0=(1, 0, 0, 0), B1=(-1, 0, 0, 0), B2=(1, 0, 0, 0), and B3=(-1, 0, 0, 0) corresponding to the coefficients. The ~~transmission~~ data sequences obtained from the third vector row of the unitary matrix ~~is~~ are C0=(1, 0, 0, 0), C1=(1, 0, 0, 0), C2=(-1, 0, 0, 0), and C3=(-1, 0, 0, 0) corresponding to the coefficients. The ~~transmission~~ data sequences obtained from the fourth vector row of the unitary matrix ~~is~~ are D0=(1, 0, 0, 0), D1=(-1, 0, 0, 0), D2=(-1, 0, 0, 0), and D3=(1, 0, 0, 0) corresponding to the coefficients.

Please replace the paragraph beginning at page 12,line 6, with the following amended paragraph:

The transmission data sequence is produced by delaying, and adding ~~0 data~~ a null time to, the plurality of ~~transmission~~ data sequences. FIG. 4 shows the relation between the ~~transmission~~ data sequences and the transmission data sequence using a general expression. When the ~~transmission~~ data sequences A-D are represented by A=(a0, a1, ..., aN-1), B=(b0, b1, ..., bN-1), C=(c0, c1, ..., cN-1), and D=(d0, d1, ..., dN-1), the transmission data sequence can be produced by adding ~~0 data~~ a null time to them as shown by the determinant in FIG. 4(a).

Please replace the paragraph beginning at page 12, line 15, with the following amended paragraph:

When the ~~transmission~~ data sequences A-D are represented by A=(a0, a1, ..., aN-1, 0, ..., 0), B=(b0, b1, ..., bN-1, 0, ..., 0), C=(c0, c1, ..., cN-1, 0, ..., 0), and D=(d0, d1, ..., dN-1, 0, ..., 0), the transmission data sequence can be represented by the determinant in FIG. 4(b).

Please replace the paragraph beginning at page 12, line 23, with the following amended paragraph:

A produced transmission signal can be acquired by a matched filter (matched filter) corresponding to the coefficients of the spreading sequence used for producing the transmission signal. For example, a matched filter, which is a filter that de-spreads the ~~transmission~~ data sequence A and acquires the de-spread data, is formed corresponding to the coefficients of the spreading sequence used for producing the ~~transmission~~ data sequence A.

Please replace the paragraph beginning at page 13, line 25, with the following amended paragraph:

According to the transmission signal production of the present invention, a plurality of transmission data, produced by multiplying them by the coefficients of the ZCZ sequence, are

arranged with a delay between each two of them to allow a finite number of data sequences ~~of transmission data~~ to have a periodic zero correlation zone for producing an impulse-like signal.

Please replace the paragraph beginning at page 15, line 13, with the following amended paragraph:

This indicates that, in the transmission data sequence produced according to the present invention, a finite number of ~~transmission~~ data sequences have a range in which the non-periodic cross correlation function is 0 (a range in which continuous 0s are delimited by (-1) in FIG. 6(b) and in aB*Af described above) in an arbitrary combination of a plurality of transmission data sequences. The non-periodic cross correlation function is a periodic cross correlation function when the length is infinite.

Please replace the paragraph beginning at page 19, line 25, with the following amended paragraph:

The ~~transmission signal production method,~~ communication method~~, and the data structure of the transmission signal~~ according to the present invention ~~are~~ is advantageous ~~and are~~ to and useful for the multi-path environment of mobile communication.